

THE RAINBOW PLUS SPECTRUM INTERFACE

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1.0 INTRODUCTION:

YOU ARE ABOUT TO INTRODUCE YOUR TIMEX COMPUTER INTO A NEW WORLD OF COMPUTING ! The RAINBOW plus interface will turn your computer into a SPECTRUM. With the RAINBOW plus attached your computer will be compatible with the most popular computer in Great Britain and Europe. The RAINBOW plus interface will allow you run to Spectrum programs numbering upwards to 5400! The advanced electronics in the RAINBOW plus allows it to run more software titles than many other emulators and more than just switching ROMs. The RAINBOW plus plugs into the expansion port of the computer - this eliminates possible damage to the computer by not having to open the case. It also allows you to use the cartridge dock when in the TIMEX 2068 mode. The mode switch allows changing operating systems with the interface attached.

In addition to running spectrum software, the RAINBOW plus also contains a Spectrum compatible expansion port. This allows your computer to run new and exciting Spectrum hardware like the DAMCO/ROTRONICS WAFADRIVE mass storage system, high resolution light pens, Spectrum joystick adapters, voice and speech synthesizers and more !

2.0 INSTALLATION

WITH THE COMPUTER'S POWER TURNED OFF, attach the RAINBOW plus interface to the expansion port of the Timex 2068 computer. ALWAYS BE CERTAIN THAT THE KEY IS IN ITS PROPER POSITION IN THE INTERFACE'S CONNECTOR. IT IS IMPORTANT THAT THE INTERFACE BE INSTALLED PROPERLY TO PREVENT DAMAGE TO THE COMPUTER OR THE DEVICES BEING ATTACHED. To the left of the Spectrum expansion port in the rear of the interface is a small slide switch. This switch is used for selecting the operating system desired. Moving the switch to the left (as viewed from the front) to the position marked "T" will keep the computer in the Timex 2068 mode, moving the switch to the right to the position marked "S" will place the computer into the Spectrum mode. THE COMPUTER SHOULD ALWAYS BE TURNED OFF WHEN SWITCHING BETWEEN MODES ! NOTE - This switch is used only to change operating systems it does not change the expansion port from Spectrum to Timex. The Expansion port always remains Spectrum configured.

PRODUCTS DESIGNED EXCLUSIVELY FOR THE TIMEX 2068 COMPUTER SHOULD NOT BE ATTACHED TO THE EXPANSION PORT OF THE RAINBOW plus INTERFACE. However the 2040 printer and the 2050 modem can be used. It is safer to install products designed for the 2068 computer directly into the computer, and then install the RAINBOW plus interface into the pass through connector if so equipped.

3.0 USING THE SPECTRUM MODE

Upon turning on the computer in the Spectrum mode (switch position "S"), the display will go through two initializations. First the Timex copyright, followed by a momentary black screen, then the Sinclair copyright. Your computer is now operating in the Spectrum mode.

With the UDG area protected your RAINBOW plus offers 41472 bytes of free RAM - just like the 48K Spectrum. After CLEARing 65535 both the 2068 with interface attached, and the 48K Spectrum computer indicates 41640 bytes of RAM. Try this : CLEAR 65535 and/or PRINT 65535-USR 7962. Note: always try CLEAR 65535 before you decide a Spectrum program will not RUN.

The Timex 2068 computer requires a much stronger signal than does it's British counterpart. Many Spectrum tapes are recorded at lower volume level than Timex 2068 tapes. When loading a Spectrum program, your Volume setting on your recorder should be at a higher level. Another effective way to boost the signal is by using the RADIO SHACK MINI AMPLIFIER (277-1008). This is also usefull in loading those stubborn Timex programs !

There are also some keyboard differences between the two computers. The following shows the functions not available on the Spectrum computer along with the function which does exist at the corresponding key location

KEYBOARD DIFFERENCES

KEY	TIMEX	SPECTRUM
P	RESET	Ⓒ
A	FREE	~
S	STICK	I
F	ON ERR	{
G	SOUND	}

The Spectrum operating system is contained on EPROM within the RAINBOW plus interface. Placing this on EPROM allows some of the "known" bugs to be corrected. SCREEN\$, 1/2-.5 and INT-65536 errors have been corrected. A special thanks to Robert Orrfelt of GESSO (3436 Bay Rd., Redwood City, Ca. 94063) for providing this information, as well as the EPROM programmer. In addition to the above corrections, a USR graphics set has been added. To use enter USR then select the graphics function.

The following is an excerpt from the manual provided with the GESSO EPROM programmer.

Section 3.

THEORY

There are three formats reconized by the TS2068 on initialization: LROS, BASIC AROS, and Machine Code AROS. BASIC AROS cartridges can also contain machine code, BASIC variables, etc.

LROS

An LROS replaces the operating system and takes over all functions of the computer. An example of an LROS is the SPECTRUM emulator. During the initialization process the cartridge is switched in and the second byte is read. If it is an 01 the fifth byte is used to switch in the proper chunks. A jump is then made to the address in the third and fourth bytes. From now on control is passed to the cartridge EPROM.

Making a SPECTRUM EPROM gives the opportunity to correct some of the errors in the original version. Example 1 on the next page shows my version with modifications.

Addresses 0001-0004 must be replaced with the LROS header. The starting address in the header is therefore to an unused SPECTRUM address (3870h). This address contains the original code starting at 0000 and ends with a jump to the normal initialization address for the SPECTRUM.

An alternate USR character set was added at 3CFFh.

20	20	20	20	20	00	00	00	00	!
00	00	50	50	50	00	00	00	00	!
15	30	15	24	00	00	00	00	00	!
70	10	70	10	70	00	00	00	00	!
00	00	00	42	42	24	50	00	00	!
50	50	50	70	10	00	00	00	00	!
70	40	70	10	70	00	00	00	00	!
70	40	70	50	70	00	00	00	00	!
00	00	15	24	00	24	30	20	00	!
70	10	10	10	10	00	00	00	00	!
70	50	70	50	70	00	00	00	00	!
70	50	70	10	70	00	00	00	00	!
01	01	01	01	01	01	01	01	01	!
00	00	00	00	00	00	00	00	00	!
00	15	15	24	24	42	7E	00	00	!
00	00	00	7E	24	24	24	00	00	!
70	50	50	50	50	00	00	00	00	!
00	10	00	54	38	10	00	00	00	!
70	10	70	40	70	00	00	00	00	!
20	70	20	20	20	00	00	00	00	!
00	00	00	44	24	24	30	40	00	!

Figure 3-1. Mod B USR Character Set.

Sinclair Spectrum EPROM Mod. B

The following are changes to the Spectrum code designated as Mod. B. The addresses and codes are given in hex. Thanks to Dr. Ian Logan Dr. Frank O'Hara for identifying the "bugs".

1. 0001 01 LROS
 0002 70 Starting address 3870
 0003 38
 0004 FC Chunks 1 and 2
 0005 42 Mod. # (B)
2. 006D 28 JR Z was JR NZ
3. 0A33 19 was 18 CHR\$ 8 (backspace) error line 0 etc.
4. 1204 FF address of new USR graphic characters (3CFF)
 1205 3C
5. 1539 changed logo
 1539 Sinclair Spectru
 1549 m Mod. B
6. 257D C9 was C3 SCREEN\$ error
7. 3200 DB was E1 1/2-.5 error
8. 3032 F5 PUSH AF INT -65536 etc. error
 3033 3C INC A
 3034 B3 OR E
 3035 B2 OR D
 3036 C22532 JP NZ,3225H
 3039 C33032 JP 3230H

 3223 181A JR 323FH
 3225 F1 POP AF
 3226 77 LD (HL),A
 3227 23 INC HL
 3228 73 LD (HL),E
 3229 23 INC HL
 322A 72 LD (HL),D
 322B 2B DEC HL
 322C 2B DEC HL
 322D 2B DEC HL
 322E 01 POP DE
 322F C9 RET
 3230 F1 POP AF
 3231 2B DEC HL
 3232 3691 LD (HL),91H
 3234 23 INC HL
 3235 3680 LD (HL),80H
 3237 3C INC A
 3238 18ED JR 3227H
9. 3870 F3 DI Boot from address 0000
 3871 AF XOR A
 3872 11FFFF LD DE,FFFFH
 3875 C3CB11 JP 11CBH

Example 1. SPECTRUM EPROM

4.0 SPECTRUM EXPANSION PORT

The Expansion port of the RAINBOW plus has been configured to closely duplicate that of the Spectrum computer. When used with the Spectrum operating system, hardware designed for use with the Spectrum can be used with the Timex 2068. Because there are some major differences between the two computers, the following Spectrum signals are not used on the interface:

IORQGE THIS SIGNAL APPEARS TO BE CONTROLLED INTERNALLY IN THE
TIMEX 2068

VIDEO-

Y----- THESE SIGNALS ARE USED FOR EXTERNAL VIDEO (SUCH RGB AND
Z----- MONITOR) ON THE SPECTRUM
U-----

-12v--- BASED ON THE INFORMATION AVAILABLE THESE VOLTAGES ARE
-5v--- ARE NOT USED BY HARDWARE MANUFACTURERS

THE FOLLOWING IS A LIST OF THE SIGNALS USED ON BOTH THE TIMEX
2068 COMPUTER AND THE RAINBOW plus EXPANSION PORTS:

TS 2048 BUSS

TOP	BOTTOM
GND	1 GND
EAR	2 SPKR/TAPE OUT
A7RQ	3 +15V
D7	4 +5V
DZIN	5 not used
slot	6 slot
D0	7 GND
D1	8 GND
D2	9 0
D6	10 A0
D5	11 A1
D3	12 A2
D4	13 A3
INT	14 A15B
INT	15 A14B
HALT	16 A13B
HREQB	17 A12
TOROB	18 A11
ROB	19 A10
WRB	20 A9
BUSAK	21 A8
WAIT	22 A7
BUSRQ	23 A6
RESET	24 A5
M1	25 A4
RFSIB	26 not used
EXROM	27 RGB red
ROSCS	28 RGB green
BE	29 RGB blue
IOAS	30 BUSISO
SOUND	31 VIDEO
GND	32 GND

ZX SPECTRUM BUSS

TOP	BOTTOM
A15	1 A14
A13	2 A12
D7	3 +5V
not used	4 +9V
slot	5 slot
D0	6 GND
D1	7 GND
D2	8 0
D6	9 A0
D5	10 A1
D3	11 A2
D4	12 A3
INT	13 IORQGE
INT	14 GND
HALT	15 VIDEO
HREQ	16 Y
TORQ	17 Z
RD	18 U
WR	19 BUSRQ
-5V	20 RESET
WAIT	21 A7
+12V	22 A6
-12V	23 A5
M1	24 A4
RFSH	25 ROMCS
A8	26 BUSAK
A10	27 A9
not used	28 A11